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WEIGHING DOWN AMERICA: 2020 UPDATE

A Community Approach against Obesity

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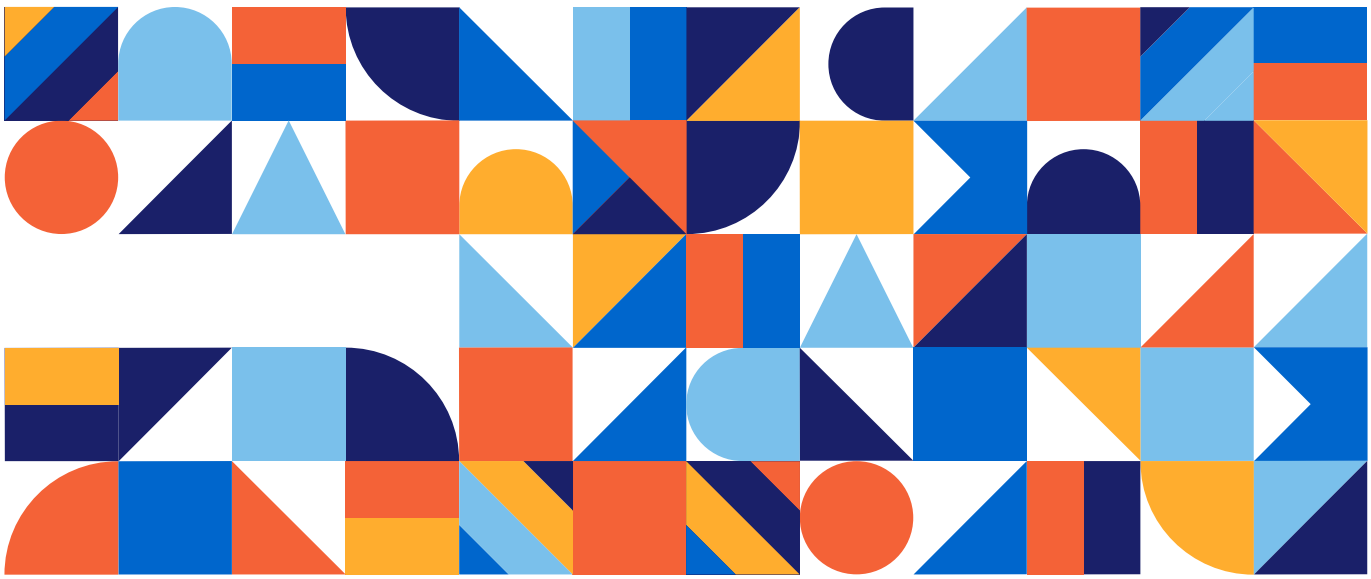

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EXECUTIVE SUMMARY

The economic and social cost of obesity in America is at an all-time high and continues to rise. We estimate its cost to be roughly 6.76 percent of gross domestic product (GDP) in 2018 compared to 5.57 percent in 2014, or in dollar terms, $1.389 trillion in 2018 compared to $0.976 trillion in 2014. The current pandemic is likely to raise this cost even higher.

Economic and Social Cost of Obesity in America

2018		2014	
6.76% of GDP	$1.389 Trillion	5.57% of GDP	$0.976 Trillion

Although Black and Hispanic populations, and individuals of all races aged 40-59 are most at risk, the latest statistics show noticeable growth in obesity prevalence, from 2014 to 2018, within the male population, especially white males and males of all races aged 20-59. In contrast, the data look more encouraging for women. The obesity rates among Hispanic women and all women aged 40-59 show a marked decline during the same period.

Obesity impacts segments of the US population differently based on their behavioral and socioeconomic profiles. The Milken Institute COVID-19 Community Explorer sorts US counties around eight profiles of communities that share common patterns across behavioral, economic, and social factors. This report uses these communities and identifies which of the 26 factors considered are systemically correlated with high obesity rates for each community. No causal conclusions can be drawn from these correlations without further examination, and the scope of the analysis is limited to the factors considered with no implication for all the other factors relevant to obesity prevalence.

This report identifies three groupings that matter for a large part of the US population:

- Social and behavioral factors, such as unemployment, excessive drinking, smoking, post-secondary education, and single-parent households, have the strongest association with obesity prevalence across all eight communities' profiles.

- Urban-rural factors, including rurality, housing concerns, population density, metropolitan area, violent crime rate, and the number of fast-food establishments per 100,000 people, have the second strongest association with obesity prevalence across four communities, representing 78 percent of the US population.

- The Black population factor has the third strongest association with obesity prevalence across four communities. These communities represent 61 percent of the US population.

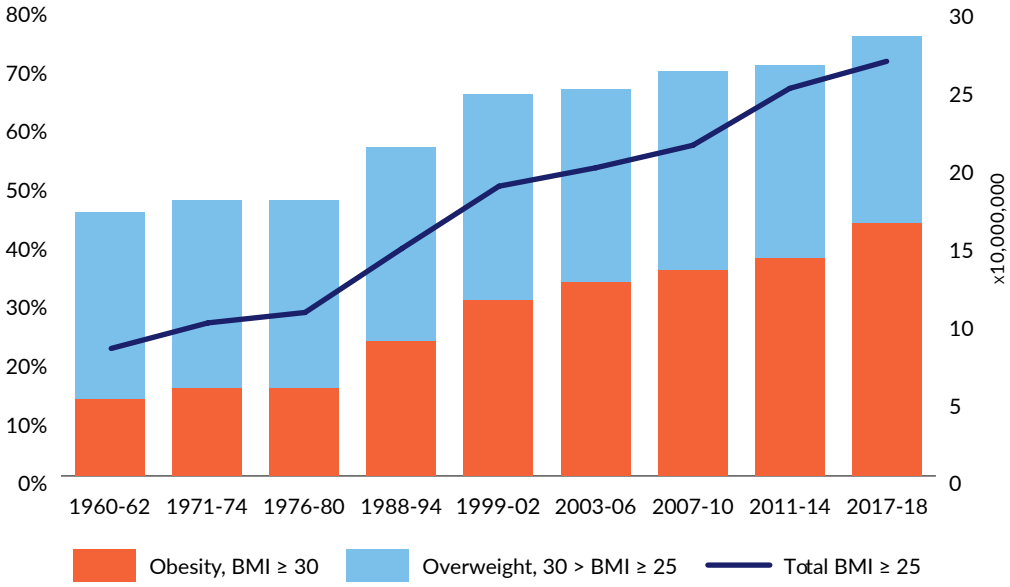
The analysis combines health, behavioral, economic, and social data sets and suggests that some aspects of the obesity epidemic would be better addressed at the local level, while others would benefit from a federal initiative. It also identifies factors for each community to consider when coordinating national and local authorities and other partners such as health-care professionals, business and community leaders, school, and child care.

Finally, our analysis show that the data sets collected need to be properly combined, processed, and analyzed to inform policy in a meaningful and actionable manner.

INTRODUCTION

Obesity remains a major issue in the US. Its prevalence rate continues to increase, from an average of 37 percent for 2011-2014 to 43 percent for 2017-2018 (see Figure 1). The impacts of obesity are multiple and complex, from high economic and social costs to poor mental health and quality of life. It is often associated with the leading causes of death, including diabetes, heart disease, stroke, and some types of cancer. Even in the context of COVID-19, obesity is often linked to increased virulence of the infection.

Figure 1: Adults with Overweight (30 > BMI ≥ 25) and Obesity (BMI ≥ 30)



Source: *National Health and Nutrition Examination Survey (except for 1962 [National Health Examination Survey, or NHES]); 2018 overweight percentage from 2015-16 data, US Census Bureau*

In this report, we first describe the latest US trends for obesity in terms of age, race, and gender and provide an updated estimate of the associated social and economic costs. We show that the worsening of the obesity epidemic impacts segments of the US population differently. As a result, any effective solution would have to be tailored to these segments' specific needs. But can we identify these segments beyond just age, race, or gender?

The second part of the report answers that question using behavioral, economic, and social factors at the county level. We leverage our ongoing work on communities in America, focused on identifying communities' specificities using large data sets and the latest techniques, such as machine learning. The counties are clustered in eight communities whose profiles are based on common patterns across counties. We then identify which combination of factors should be tackled first in each community to help prevent obesity. The solution to the obesity epidemic requires a multifaceted approach that will ultimately support prevention and treatment. This report advocates for a data-driven approach to public health policy that relies on local and federal efforts and diverse partners from health care, business, community leaders, schools, and child care.

Obesity is often mischaracterized as a lifestyle choice while it is a complex chronic disease resulting from social, environmental, genetic, and behavioral factors.

DO AGE, GENDER, AND RACE MATTER?

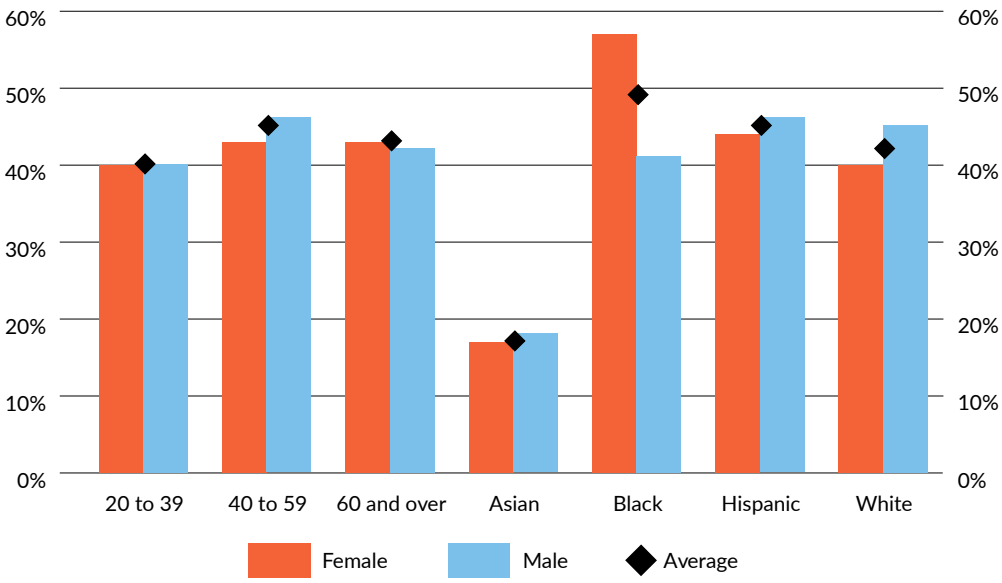
The prevalence of obesity, defined as a body mass index (BMI) equal to or greater than 30, varies by age, gender, and race. For this reason, Figures 2 and 3, which compare obesity rates across age group, gender, and race for 2014 and 2018, provide a more nuanced picture than Figure 1.

Figure 2 shows that, in 2018, the Black population has a higher obesity rate among all races and age groups considered. Within that population, women have the highest obesity rate, with 57 percent, followed by the Hispanic population and adults of all races aged 40-59, with a rate close to 45 percent for both men and women. These findings did not change since 2014 (see Figure 3). It is worth noting that focusing on different populations highlights the impact of social determinants of health, not of race.

However, 2018 data reveal a worsening trend among men. The obesity rate for White men increased from 35 percent to 45 percent between 2014 and 2018, while the obesity rate for men of all races aged 20-59 increased by almost 10 percentage points: from 32 percent to 40 percent for men aged 20-39 and from 37 percent to 46 percent for men aged 40-59.

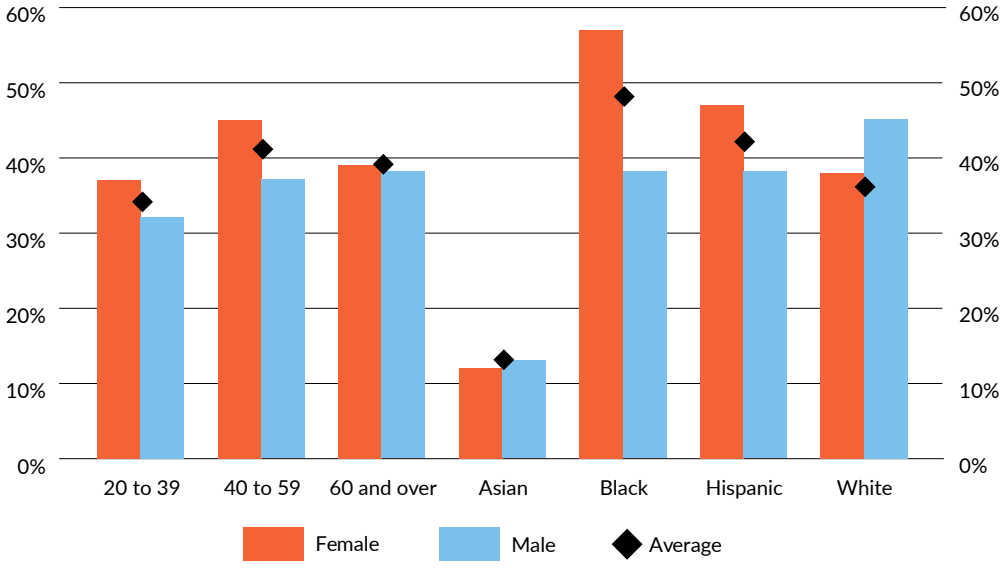
In contrast, the data for women are mildly encouraging. During the same period, the obesity rate decreased by three percentage points to 44 percent for Hispanic women and by two percentage points for women aged 40-59 to 43 percent. The stabilization of the obesity rate for Black women is also encouraging.

Figure 2: Adults with Obesity (BMI ≥ 30), by Age, Gender, and Race for 2018



Source: *National Center for Health Statistics (2020)*

Figure 3: Adults with Obesity (BMI ≥ 30), by Age, Gender, and Race for 2014



Source: *National Center for Health Statistics (2016)*

HEALTH CONDITIONS AND ECONOMIC AND SOCIAL COSTS ASSOCIATED WITH OBESITY

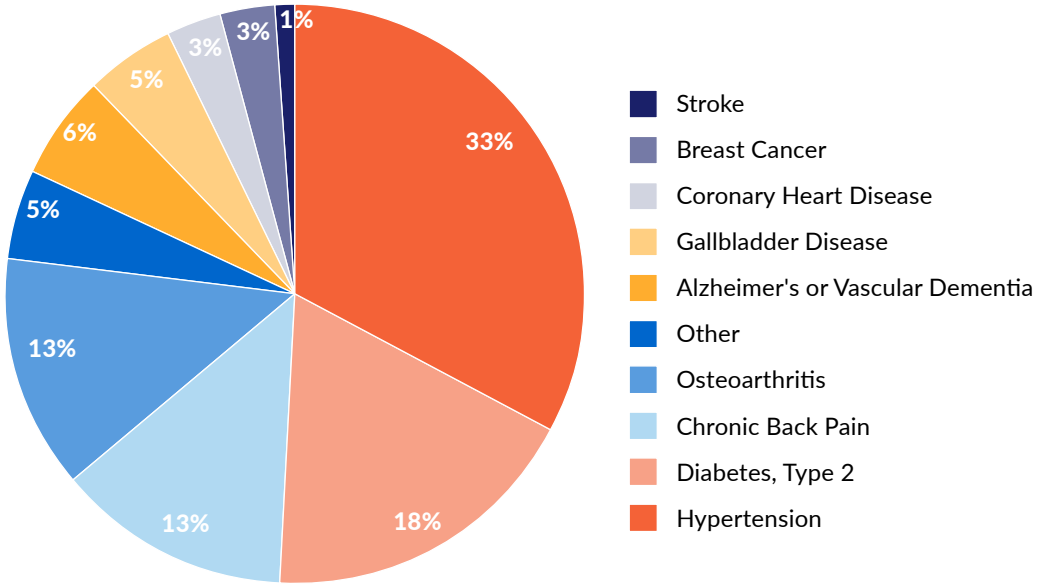
The association of obesity with an increased risk for many severe diseases and health conditions is well-documented. Following Waters and DeVol (2016), we use the population attributable risk to approximate the percentage of each disease's cases attributable to obesity.[1] In turn, these percentages allow us to derive the economic cost of obesity, its distribution across diseases (Figure 4), and the number of deaths for each condition attributable to obesity (Figure 5).

We estimate the total costs in 2018 to be $1.39 trillion, consisting of $370 billion in direct costs for medical treatment for each condition and indirect costs of $1.02 trillion for lost workdays, calculated as lost employee output.[2] The total estimated cost of obesity equals 6.76 percent of GDP in 2018 compared to 5.57 percent in 2014.

1 Northridge (1995)

2 See Appendix A2 for more details.

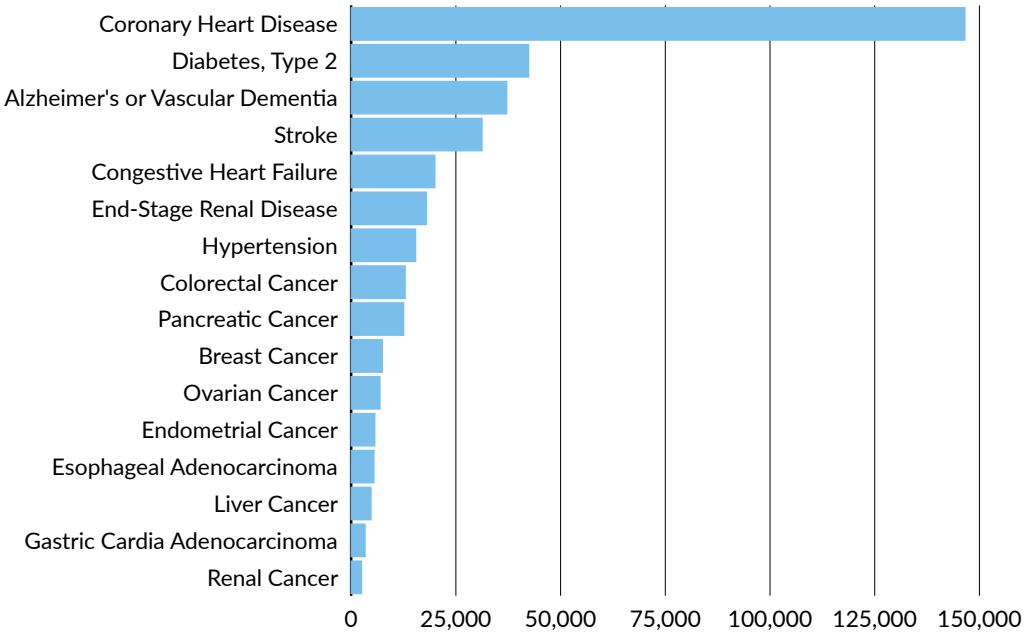
Figure 4: Distribution of the Total Attributable Cost per Health Condition, 2018



Source: *Appendix A1, A2, A3, and authors' calculations*

Hypertension, type 2 diabetes, chronic back pain, and osteoarthritis represent 77 percent of total costs (see Figure 4), or $1.07 trillion. Further, coronary heart disease, type 2 diabetes, Alzheimer's or vascular dementia, and stroke represent 68 percent of the 257,313 deaths attributable to obesity (see Figure 5).

Figure 5: Number of Deaths Attributable per Health Condition, 2018



Source: *Appendix A1, A2, A3, and authors' calculations*

Deriving a precise estimate of the cost of obesity is challenging. Medical expenses and lost workdays represent only a portion of obesity-related costs. Other expenses, such as the use of informal caregivers or those related to lost productivity outside of work, premature mortality, and impact on family and potential income, are extremely difficult to measure and are not included here.

Yet, as imperfect as this measure is, its message is clear: Obesity remains very costly to society. As a result, preventing and reducing obesity should be a priority for health and other community authorities.

OBESITY AND COMMUNITIES

According to the Centers for Disease Control and Prevention (CDC), "The human suffering and economic impacts of diseases caused by obesity are having a disproportionate geographic impact." The 2018 data from CDC's Behavioral Risk Factor Surveillance System (BRFSS) show that in 12 states, at least 35 percent of adults were classified as having obesity. In an additional 23 states, 30 percent to 35 percent of adults met the BMI criterion. Finally, the Midwest (33.9 percent) and South (33.3 percent) had the highest prevalence of obesity, followed by the Northeast (29.0 percent) and the West (27.4 percent).

Using data from the Bureau of Labor Statistics, the BRFSS, the Census, County Health Rankings, and the Centers for Medicare & Medicaid Services, the COVID-19 Community Explorer maps the prevalence of chronic conditions, among them obesity, to eight profiles across the entire US population defined by behavioral, economic, and social factors. The cluster analysis that defines each profile identifies similarities across counties and sorts the information into the categories that have been defined endogenously during the clustering process. The categories are:[3]

- **Social and behavioral factors:** unemployment, excessive drinking, smoking, post-secondary education, and single-parent households;
- **Urban-rural factors:** rurality, housing concerns, population density, metropolitan area, violent crime rate, and number of fast-food establishments per 100,000 people;
- **Hispanic or White factors:** percentage of Hispanic population, percentage of uninsured adults, and percentage of White population;
- **Black population factor:** percentage of the population that is black;
- **Age-dependency factors:** percentage of the population above 18 and the percentage of the population under 65;

3 Only statistically significant factors are listed. The cluster analysis selects the factors in each category, and we chose the name of the category so it describes the combination of factors.

- **Economic factors:** average income for the Black population, the White population, and the entire population, and percentages of Black and Hispanic populations experiencing poverty; and

- **Physical environment factors:** limited access to healthy food for the low-income population, level of pollution, and reliance on manufacturing activity.

The approach offers many benefits. First, unlike most existing studies, it accounts for the impact of several factors commonly associated with obesity, and it estimates the grouping of these factors. Each community, defined by a specific combination among these groups of factors, comprises counties that do not have to be geographically close. Second, the approach allows us to identify the most predominant factors related to high obesity rates at the community and federal levels.

COMMUNITIES' SOCIOECONOMIC PROFILES

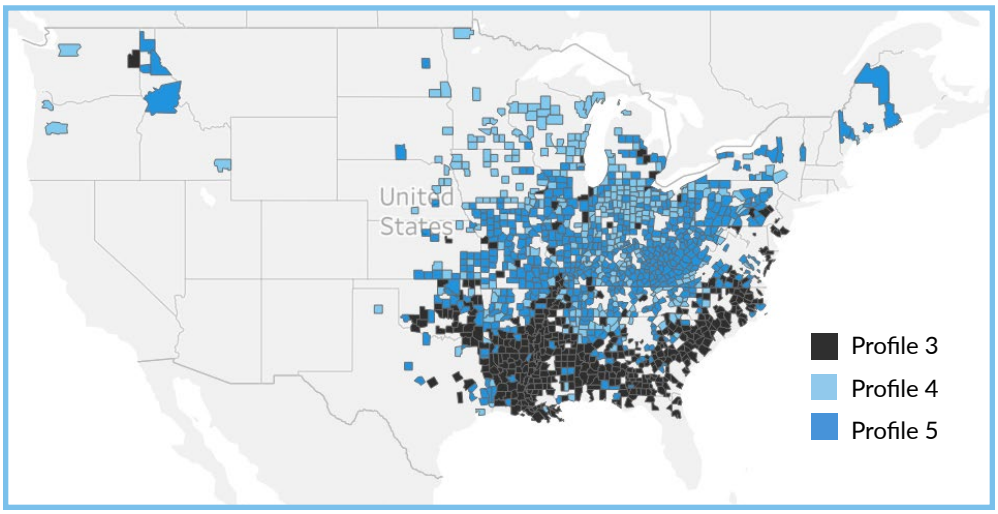
The COVID-19 Community Explorer identifies eight profiles of communities across the US counties:

- **Profile one** represents 38 percent of the US population and is a younger, highly educated, and ethnically diverse community residing in large metro areas.
- **Profile two** represents 25 percent of the US population and consists of economically prosperous, mostly White counties in large metro areas with an educated workforce.
- **Profile three** represents 12 percent of the US population and consists of counties with the largest Black population and the lowest average income among the eight communities, with high rates of unemployment, single-parent households, and violent crime.
- **Profile four** represents 7 percent of the US population and consists of predominantly White, rural counties with high unemployment rates, a less educated workforce, and relatively low average income when compared to the other communities.
- **Profile five** represents 6 percent of the US population and consists of predominantly White counties whose local economy strongly depends on manufacturing.
- **Profile six** represents 5 percent of the US population. It is the youngest cohort with the highest proportion of Hispanic population, the least educated workforce, the least access to healthy food, and the highest rate of population without health insurance.
- **Profile seven** represents 4 percent of the US population and consists of mostly White, elderly retirement communities.
- **Profile eight** represents 3 percent of the US population and consists of a rural, older, and White cohort who is relatively educated and has limited access to healthy food.

We then calculate the rate of obesity prevalence for each community. Community profiles three, four, and five have the highest rates, with 37 percent, 35 percent, and 34 percent, respectively. These communities are mostly geographically concentrated (see Figure 6). Yet, their economic and social profiles, reported in Table 1, provide added insights.

Overall, these three communities tend to have a higher percentage of smokers and relatively higher unemployment than the US average. Yet, they differ in many other dimensions. For example, community profile three has the highest Black representation (35 percent of the counties' population), with a high level of single-parent households (average 46 percent), and the highest average crime rate. The community profile is concentrated in the lower Southeastern states such as South Carolina, Georgia, Alabama, Mississippi, and Louisiana.

Figure 6: Communities with the Highest Obesity Rates



Source: *Milken Institute COVID-19 Community Explorer (2020)*

In contrast, community profiles four and five are mostly White (88 percent of the population). Profile five has the most educated population (57 percent with some post-secondary education), a strong dependence on manufacturing jobs, and the highest income level of these three profiles. It captures old manufacturing towns throughout the Midwest.

Finally, community profile four is the most rural of the three communities. It is concentrated in northern Southeastern states and some eastern Midwestern states such as Ohio, Missouri, and Indiana.

Table 1: Profiles of Communities with the Highest Obesity Rate

Communities	Profile 3		Profile 4		Profile 5		All communities
Factors	**Mean**	**Std Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**
Social and Behavioral Factors							
Smoking (%)	20	3	20	3	18	3	17
Excessive Drinking (%)	15	3	16	3	18	3	18
Some College (%)	52	11	53	9	57	10	58
Unemployment Rate (%)	5	1	5	1	4	1	4
Single-Parent Households (%)	46	11	32	7	30	7	33
Urban-Rural Factors							
Rural (%)	54	30	70	25	59	24	53
Population (#)	94,013	182,037	41,604	57,871	55,048	87,633	197,569
Violent Crime Rate (#)	456	268	204	130	205	154	271
Severe Housing Cost (%)	14	3	10	2	9	2	12
Metro (%)	37	48	35	48	32	47	42
Fast Food Locations per 100,000 People	246	1,045	278	706	135	368	424
Physical Environment Factors							
Average Polluted Days (#)	10	1	10	1	10	1	9
Limited Access to Healthy Food (%)	10	7	6	5	6	4	8
Manufacturing (%)	19	39	3	16	100	0	27
Hispanic-White Population Factors							
Uninsured Adults (%)	16	5	12	5	10	5	14
Hispanic (%)	6	5	3	2	5	4	12
White (%)	55	15	89	9	88	8	72
Black Population Factor							
Black (%)	35	18	5	8	3	4	10
Age-Dependency Factors							
Under 18 (%)	22	2	21	2	23	2	22
Over 65 (%)	18	3	20	3	19	3	19
Economic Factors							
White Average Household Income ($)	50,513	8,578	46,611	8,579	52,845	9,373	57,265
Black Average Household Income ($)	28,990	7,191	30,725	11,949	36,704	15,347	41,554
Average Household Income ($)	38,152	14,437	45,372	22,775	45,459	14,776	48,137
Black Poverty Rate (%)	33	9	35	24	28	19	29
Hispanic Poverty Rate (%)	33	19	28	20	26	15	24

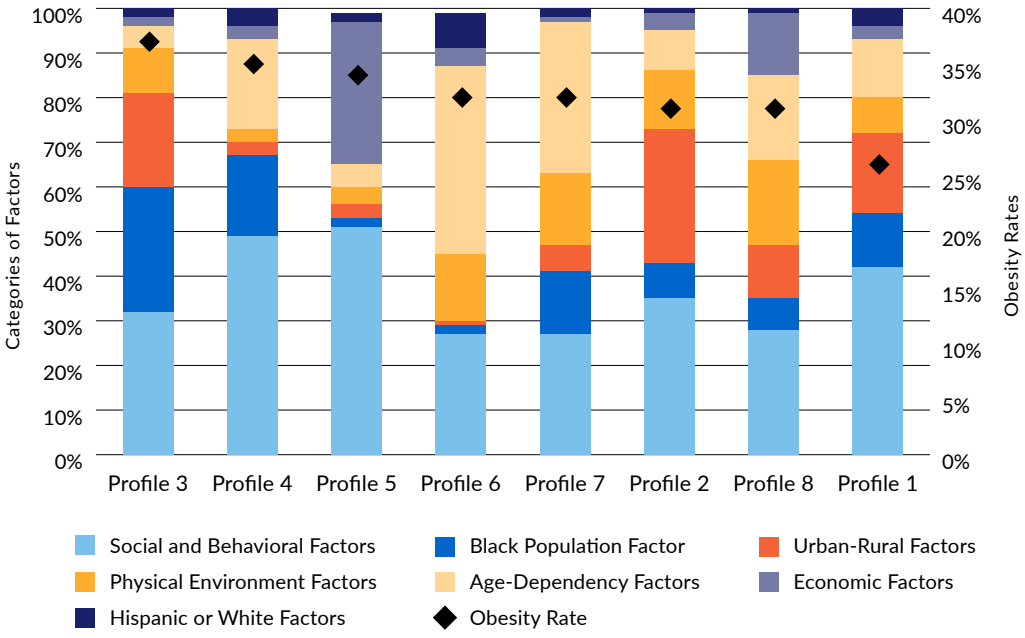
Note: *Only statistically significant factors are listed.*
Source: *Milken Institute COVID-19 Community Explorer (2020)*

IMPORTANCE OF SOCIOECONOMIC FACTORS FOR OBESITY

The previous section uses combinations of behavioral, economic, and social factors to define eight communities' profiles. This section uses the same combinations to estimate their association with the obesity rates for each community.

Following Grömping (2006), the relative importance of each factor is quantified as the percentage of obesity rates explained by a group of factors, as depicted in Figure 7. The highest percentage is the most important group of factors in tackling obesity. Note these associations are limited to the factors considered in the analysis with no implication for all the other factors relevant to obesity prevalence.

Figure 7: Relative Statistical Importance of the Social Determinants of Health in Explaining Differences in Obesity Rates



Note: *Community profiles sorted by obesity rates, starting with the highest on the left.*
Source: *Milken Institute COVID-19 Community Explorer (2020)*

The social and behavioral factors are significant in all communities, especially profiles three, four, and five. Yet, when they need to be combined with other factors to explain at least 60 percent of the obesity rate, the combination is specific to the community.

- For profile three, the social and behavioral factors combined with the Black population and urban-rural factors explain 81 percent of the obesity rate. The importance of the Black population factor is not a surprise as this profile has the largest Black population, 35 percent.

- For profile four, the social and behavioral factors combined with the relatively older population explain close to 70 percent of the obesity rate. Of note, the Black population factor explains an additional 18 percent of the obesity rate while the Black population is relatively small, on average 5 percent.

- For profile five, the social and behavioral factors alone explain 51 percent of the obesity rate. Economic factors explain an additional 32 percent. Of note, this community has the highest average incomes and the lowest poverty level among these three communities.

The obesity prevalence rates for the remaining community profiles are close to 30 percent, except for community profile one at 26 percent.

- For profiles six and seven (the youngest and oldest cohorts), the age-dependency factors most explain the obesity rates. When combined with the social and behavioral factors, the percentages increase to greater than 60 percent of the obesity rates.

- For profile two, the social and behavioral factors combined with urban-rural and physical environment factors explain 78 percent of the obesity rate.

- For profile eight, the social and behavioral factors combined with age-dependency, physical environment, and economic factors, explain 80 percent of the obesity rate.

- For profile one, the social and behavioral factors alone explain 42 percent of the obesity rate. Urban-rural factors explain an additional 18 percent.

To be effective, policy responses to obesity must target community-specific factors. The overwhelming importance of social and behavioral factors across all eight communities highlights the potential of complementarity between federal and community-driven initiatives.

OBESITY, COMMUNICABLE DISEASES, AND COVID-19

The current pandemic provides an urgent impetus to address obesity. Several studies are already linking some of the worst COVID-19 cases to obesity, and many more provide useful insights based on previously collected information on relatable diseases or conditions.

Infectious respiratory diseases and circulatory issues are two of the most common comorbidities in individuals characterized as having obesity. Obesity's link to increased cardiovascular risks due to the limitation of several bodily functions is well documented. Obesity has detrimental effects on lung function (diminished expiratory volume), heart function (premature development of cardiovascular disease), and metabolic function (impairment of insulin resistance). Muscogiuri et al. (2020) explain that the overarching cause of this holistic health decrease is that "obesity represents a state of low-grade chronic inflammation that can contribute to the onset of metabolic diseases [...], and can modify innate and adaptive immune responses, making the immune system more vulnerable to infections and less responsive to vaccinations, antivirals, and antimicrobial drugs."

In the context of COVID-19, several recent studies have found evidence that links obesity with increased hospitalization and admission to critical care, and the need for intermittent mandatory ventilation (IMV). Sattar et al. (2020) report that patients located in New York City under age 60 with obesity (35> BMI ≥ 30) and severe obesity (BMI ≥35) are 1.8 times and 3.6 times more likely, respectively, to be admitted to critical care than individuals with a BMI less than 30. Similarly, in a study of 124 French patients admitted to intensive care for SARS-CoV-2, Simonnet et al. (2020) find that the proportion of patients that required IMV increased with BMI categories to the 1 percent significance level: "Obesity (BMI > 30) and severe obesity (BMI > 35) were present in 47.6% and 28.2% of cases, respectfully. Overall, 85 patients (68.6%) required IMV. The proportion of patients who required IMV increased with BMI categories ($P < 0.01$), and it was greatest in patients with BMI >35 (85.7%)."

Kassir (2020) uses other respiratory infections, such as influenza A, to raise awareness of the role of obesity in increasing the spread of COVID-19 and its impact on the individual. In the case of influenza A, "obesity increases the duration of virus shedding; symptomatic patients with obesity shed virus 42% longer than adults who do not have obesity." Luzi and Radaeli (2020) draw lessons for COVID-19 cases using previous influenza pandemics data. They show that the infection's virulence can be linked to several factors, such as the state mentioned earlier of low-grade chronic inflammation and how it changes the way a body functions. One illustration is how BMI "correlates positively with infectious viruses in exhaled breath [...] which leads to the hypothesis that the higher ventilation volumes or a differential chest conformation might explain this fact."

CONCLUDING THOUGHTS

The social and economic costs of obesity remain very high, and the current pandemic only reinforces this reality. The latest statistics on obesity show that Black and Hispanic populations and individuals aged 40-59 remain the groups with the highest obesity rate. From 2014 to 2018, obesity prevalence rates increased in the male population, especially white males and males of all races aged 20-59. In contrast, the data show slight decreases in the obesity rates for Hispanic women and all women aged 40-59.

Obesity impacts segments of the American population differently, and finding a solution starts with understanding these communities' profiles. By applying clustering methods on county-level data on behavioral, economic, and social factors, we identify community profiles and the idiosyncratic combination of these factors associated with each community's obesity rate. This association is particularly relevant when designing the combination of policies or efforts that will effectively tackle the obesity epidemic at the local and federal level.

Some factors emerge as being systemically important for several communities, that is for a large part of the US population:

- Social and behavioral factors, for all eight communities.
- Urban-rural factors, for four communities that represent 78 percent of the US population.
- Black population factor, for four communities that represent 61 percent of the US population.

Obesity is a complex issue. Our results confirm that solutions will require complementary actions from federal and local authorities, as well leaders in the public and private sectors, such as health care, business, education, child care, and the community.

This report groups counties into eight communities that share similar behavioral, economic, and social elements. This allows local authorities to recognize peer authorities that are confronted with the same challenges and from whom they could learn or with whom they could team up, to address the most influential

factors, relative to the ones considered here, when it comes to obesity. It also highlights which factors are systematically important to all communities and should be addressed at the federal level.

The effectiveness of public health policy depends on its ability to address issues at the local and national levels in a responsive manner. Our analysis highlights that data availability may not be an issue. However, the data sets collected need to be combined, processed, and analyzed to inform policy in a meaningful and actionable manner.

Data sets collected need to be combined, processed, and analyzed to inform policy in a meaningful and actionable manner.

APPENDIX

Table A1: Total Prevalence of Conditions Associated with Obesity, 2018

Condition	Male	Female	Total	Population Attributable Risk
Alzheimer's and Dementia	2,175,000	3,625,000	5,800,000	.306
Asthma and COPD (adults)	7,981,655	15,365,081	23,346,736	.204
Breast Cancer (women)	------	3,577,264	3,577,264	.175
Chronic Back Pain	15,345,546	16,228,395	31,573,940	.434
Colorectal Cancer	673,580	674,507	1,348,087	.241
Congestive Heart Failure	3,184,768	2,775,492	5,960,260	.249
Coronary Heart Disease	9,400,000	8,800,000	18,200,000	.226
Diabetes (adults)	13,700,000	12,300,000	26,000,000	.507
Dyslipidemia	41,200,000	51,600,000	92,800,000	.193
End-Stage Renal Disease	433,626	312,881	746,507	.521
Endometrial Cancer	------	793,846	793,846	.515
Esophageal Cancer	34,575	13,115	47,690	.355
Gallbladder Cancer	5,600	6,380	11,980	.298
Gallbladder Disease	6,300,000	14,200,000	20,500,000	.271
Hypertension	55,200,000	53,000,000	108,200,000	.324
Liver Cancer	30,170	12,640	42,810	.175
Osteoarthritis	22,972,973	31,427,027	54,400,000	.469
Ovarian Cancer (women)	------	233,364	233,364	.485
Pancreatic Cancer	41,678	37,291	78,969	.285
Prostate Cancer (men)	3,170,339	------	3,170,339	.021
Renal Cancer	343,399	214,624	558,023	.178
Stomach Cancer	71,361	45,164	116,525	.298
Stroke	4,218,600	4,407,300	8,625,900	.213

Source: *CDC; National Institutes of Health, National Cancer Institute, Surveillance, Epidemiology, and End Results Program (SEER); and National Health and Nutrition Examination Survey (2018)*

Table A2: Costs Attributable to Obesity, 2018

Condition	Attributable Cases	Deaths	Cost in millions, 2018		
			Direct	Indirect	Totals
Alzheimer's or Vascular Dementia	1,774,906	37,152	$55,137	$25,514	$80,652
Asthma	4,766,263	728	$8,252	$13,241	$21,493
Breast Cancer	625,726	7,436	$3,696	$35,955	$39,652
Chronic Back Pain	13,709,718	------	$27,006	$159,243	$186,249
Colorectal Cancer	325,259	12,895	$4,191	$3,860	$8,051
Congestive Heart Failure	1,481,286	20,001	$6,021	$2,332	$8,353
Coronary Heart Disease	4,119,416	146,546	$16,744	$25,975	$42,719
Diabetes, Type 2	13,183,232	42,371	$87,999	$163,276	$251,275
Dyslipidemia	17,881,860	†	$13,278	0	$13,278
End-Stage Renal Disease	389,272	17,990	$2,663	0	$2,663
Endometrial Cancer	408,484	5,657	$1,834	$1,598	$3,432
Esophageal Adenocarcinoma	16,946	5,444	$671	$66	$737
Gallbladder Cancer	3,567	1,105	$17	$14	$31
Gallbladder Disease	5,547,411	914	$43,276	$21,703	$64,979
Gastric Cardia Adenocarcinoma	34,696	3,322	$1,374	$136	$1,509
Hypertension	35,048,396	15,394	$27,734	$426,857	$454,591
Liver Cancer	7,488	4,741	$37	$29	$66
Osteoarthritis	25,493,351	234	$49,657	$129,080	$178,737
Ovarian Cancer	113,153	6,882	$3,207	$443	$3,649
Pancreatic Cancer	22,504	12,542	$176	$1,064	$1,240
Prostate Cancer	65,816	633	$354	$2,498	$2,852
Renal Cancer	99,213	2,482	$1,498	$388	$1,886
Stroke	1,841,118	31,244	$10,288	$11,030	$21,318

† *Included in heart disease, diabetes, and stroke.*
Source: *CDC (2018); National Institutes of Health, National Cancer Institute, SEER (2018); National Health and Nutrition Examination Survey (2018); and authors' calculations (2020)*

Table A3: Cases and Deaths Attributable to Obesity and Overweight, 2018

Condition	Cases Attributable			Deaths Attributable		
	Overweight (25 ≤ BMI < 30)	Obesity (30 ≤ BMI)	Total	Overweight (25 ≤ BMI < 30)	Obesity (30 ≤ BMI)	Total
Alzheimer's or Vascular Dementia	594,004	1,774,906	2,368,910	12,434	37,152	49,585
Asthma	1,595,456	4,766,263	6,361,719	244	728	971
Breast Cancer	318,689	625,726	944,415	3,787	7,436	11,223
Chronic Back Pain	5,093,289	13,709,718	18,803,007	------	------	0
Colorectal Cancer	138,064	325,259	463,323	5,474	12,895	18,369
Congestive Heart Failure	514,813	1,481,286	1,996,099	6,951	20,001	26,953
Coronary Heart Disease	1,767,778	4,119,416	5,887,194	62,888	146,546	209,434
Diabetes, Type 2	3,759,473	13,183,232	16,942,705	12,083	42,371	54,454
Dyslipidemia	17,992,088	17,881,860	35,873,947	†	†	0
End-Stage Renal Disease	164,943	389,272	554,215	7,623	17,990	25,613
Endometrial Cancer	195,169	408,484	603,653	2,703	5,657	8,360
Esophageal Adenocarcinoma	7,251	16,946	24,197	2,329	5,444	7,774
Gallbladder Cancer	1,679	3,567	5,246	520	1,105	1,625
Gallbladder Disease	1,630,165	5,547,411	7,177,576	269	914	1,182
Gastric Cardia Adenocarcinoma	16,332	34,696	51,027	1,564	3,322	4,886
Hypertension	14,242,949	35,048,396	49,291,346	6,256	15,394	21,649
Liver Cancer	-------	7,488	7,488	------	4,741	4,741
Osteoarthritis	16,016,618	25,493,351	41,509,969	147	234	382
Ovarian Cancer	34,380	113,153	147,533	2,091	6,882	8,973
Pancreatic Cancer	6,170	22,504	28,675	3,439	12,542	15,981
Prostate Cancer	138,379	65,816	204,195	1,331	633	1,964
Renal Cancer	46,676	99,213	145,889	1,168	2,482	3,650
Stroke	577,249	1,841,118	2,418,368	9,796	31,244	41,040
Total	**64,851,613**	**126,959,082**	**191,810,694**	**143,095**	**375,714**	**518,810**

† *Included in heart disease, diabetes, and stroke.*
Source: *CDC (2018); National Institutes of Health, National Cancer Institute, SEER (2018); National Health and Nutrition Examination Survey (2018); and authors' calculations (2020)*

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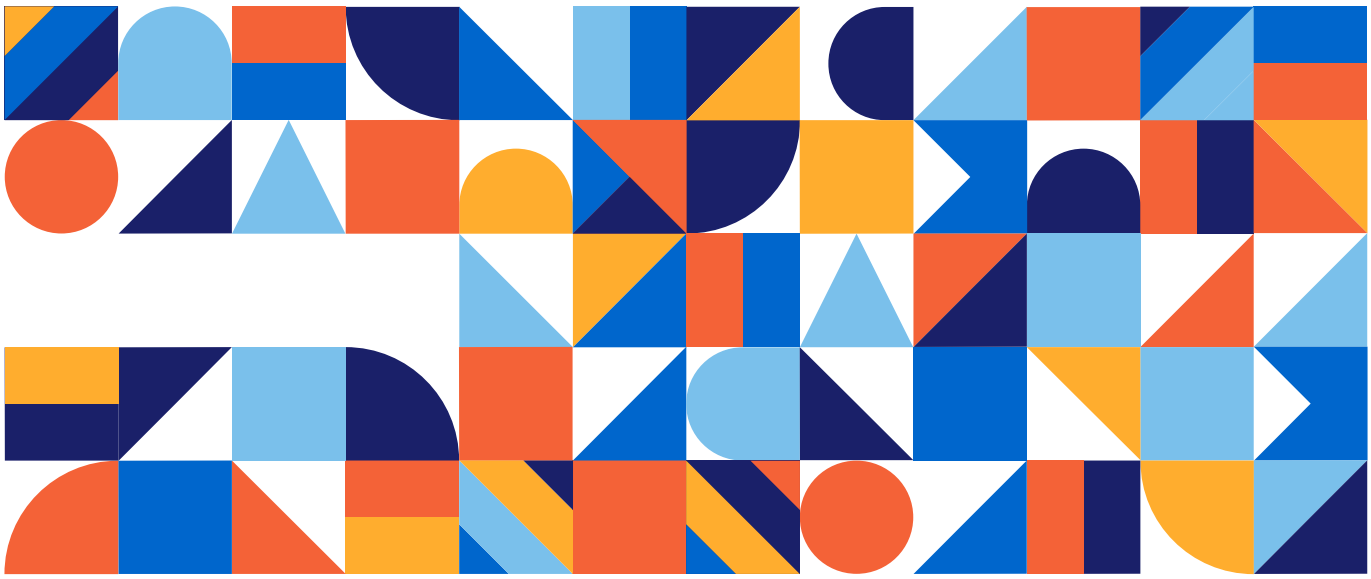

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